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Blackleg of Canola

What is it?

Blackleg, also called canker or dry rot, is a fungal disease of canola that causes significant yield losses. The disease organism, *Leptosphaeria maculans*, occurs worldwide on plants of the cabbage (crucifer) family. Common crop plants and weeds attacked by this fungus include cabbage, cauliflower, canola, mustard, rapeseed, rutabaga, stinkweed, turnip and wild mustard.

The blackleg fungus exists in a large number of strains, types or varieties like the cabbage family that it attacks. There are mild and severe types of the fungus and types that can only attack certain members of the cabbage family. For example, one type of this fungus can cause serious damage to stinkweed but does not infect canola.

The blackleg fungus that infects canola occurs in two types — avirulent and virulent. The avirulent or mild type has always been easy to find in canola fields. The disease appears on leaves and stems of canola plants in late August and does not usually cause any significant damage to the crop.

Virulent or severe blackleg differs from the mild type because it is able to infect canola early in the season and therefore has much more time to severely damage healthy canola plants. Infection can occur on seedlings as early as May but more usually develops in June and July when the canola plants are growing vigorously.

When spores of the blackleg fungus come into contact with canola or related crucifers, they germinate, grow into and infect the living cells of the host. Both types of this fungus cause lesions (dead patches with pepper-like spots) on canola leaves, pods and stems. The virulent type generally causes much deeper cankers on the canola stems than the avirulent type.

In 1975, researchers from Agriculture Canada, Saskatoon, first detected virulent blackleg in a few canola fields in north-central Saskatchewan. It has since been found in Manitoba and Alberta.

Where did it come from?

Canada imports a wide variety of horticultural crucifer seed such as broccoli, cabbage, and cauliflower. This seed have may come from areas such as Australia, North Africa, Europe, Japan or the United States, where virulent blackleg has long been a problem. The introduction of blackleg into Canada possibly occurred through the importation of infected seed from any one of these regions. In Alberta, virulent blackleg was first detected in a field of Westar in 1983, the seed of which had been grown in Saskatchewan the previous year.

How is the disease spread on the prairies?

Long distance spread of the disease across the prairies is believed to have occurred through the movement of infected seed from one area to another. Researchers from Agriculture Canada, Saskatoon, demonstrated in 1976 and 1977 that 2 per cent of canola seed samples collected in Saskatchewan were infected with virulent blackleg. Most of the infected seed samples had less than 1 per cent of the seeds carrying the blackleg fungus but there were occasional samples with more than 2 per cent. Obviously, for the seeds to pick up infection they must have been harvested from fields infected with the blackleg disease, and the fungus would have had to attack the seed pods to infect the seeds. No seed fields with the virulent blackleg disease have ever been identified in Alberta, though the possibility now exists.

When blackleg infected seed is sown, the seedling that emerges may be infected with lesions on the seedling leaves or stem. This infection (fungal lesion) can quickly form spore-producing structures called pycnidia. The pycnidia, which look like tiny pepper spots on the infected area, ooze out masses of tiny infectious summer spores called pycnidiospores. These spores are spread by rain or wind to nearby healthy seedlings. Under moist, wet or dewy conditions, these spores are able to start new infections. In a single season, one infected seed could result in the spread of the infection to many of the surrounding plants. Thus a canola crop planted from diseased seed could develop scattered areas of infection all over the field. Canola plants may be infected on the leaves, stems or flowering parts. On the leaves, lesions first appear as indefinite, pale areas gradually becoming well defined spots with grey centres peppered with minute black pycnidia. On the stems and pods, the lesions develop into sunken cankers surrounded by a blackish margin, hence the name blackleg.

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Blackleg cankers on stems can be up to several inches in length and may completely girdle the stem. Stem cankers, covered with the pepper-like spore producing bodies of the fungus, weaken the plant, often causing it to lodge. If the stem is girdled by the blackleg canker, the canola plant may prematurely ripen even if lodging does not take place.

Cankers with black margins weaken the base of the main stem predisposing the plant to lodging. Each of the pepper-like spots visible on the canker can discharge thousands of tiny infectious spores during the growing season. These cankers may remain active and discharge spores for up to three seasons or more until the stem breaks down (rots) completely in the soil.

The present situation on blackleg of canola

Annual surveys for the virulent type of blackleg have been carried out in Alberta by plant disease specialists since 1976. The province-wide survey is based on one field for every 20,000 acres of canola (140 fields for 2.8 million acres). The presence of the virulent type in Alberta was first confirmed in 1983 in a field of Westar in the east-central region. In 1984, the disease was confirmed in six fields, five of them in east-central Alberta. Twelve fields were found to have this disease in 1985, and similar numbers of fields were found to be infested in 1986 and 1987, all mainly near the Saskatchewan border. The level of disease ranged from a trace (a few plants in the field) to more than 20 per cent of plants infected with blackleg. Because of the random nature of this survey, many more fields than the dozen or so that are actually confirmed are likely to have the disease. To date in Alberta, the infection level has remained low and essentially confined to one region of the province.

In Saskatchewan this disease continues to be serious, causing considerable yield losses annually. Heaviest yield losses and infection levels occurred in fields that had grown blackleg-infected canola two years previously. Fields with three or four years between canola crops had low levels of infection. In 1985 and 1986, the blackleg surveys in Saskatchewan showed approximately 50 per cent of all fields had the disease, with estimated average yield losses of 10 per cent. The disease was rare or absent north of the North Saskatchewan river and east to Prince Albert. High levels of the disease occurred in the area between Saskatoon and Tisdale, where the disease was originally discovered, and at Cutknife and North Battleford. At scattered sites in these areas, there were occasional fields with 100 per cent of the plants infected and losses calculated near 50 per cent. However, yield losses in 1987 were lower than they have been in previous years.

In western Manitoba, the disease was first recorded in 1984 in one field, but by 1985 over 20 fields out of 63 surveyed had traces to high levels of the disease with some further increases in 1986 and 1987.

How does the disease organism survive on the prairies?

The fungus overwinters on the canola crop residue, volunteer cruciferous weeds and on the seed. The fungus can survive on all canola plant parts, particularly the stems which resist breakdown in the soil. Canola crop residue, especially larger stems, can take two to three years to break down and up to five years in a series of dry seasons. Therefore, infected stubble residue can continue to produce spores of the blackleg fungus until it is buried or broken down in the soil. Heaviest spore production comes from two-year old infected crop residue.

During wet weather in the spring, the blackleg fungus on the crop residue forms new ascospore-producing structures, similar to the pepper-like pycnidia produced during the summer on infected plants. These tiny spots on the old canola stem cankers discharge thousands of infectious ascospores into the air from May until October. The spores can travel several miles in the air before landing. If they land on canola or mustard plants they can begin new infections and continue the disease cycle. It is possible, during windstorms in the spring and summer, that infectious blackleg spores could be carried for considerable distances. Thus it is entirely feasible that some of the blackleg infections on canola in eastern Alberta could have originated from

infected crops or crop residue in Saskatchewan.

How do you prevent virulent blackleg from getting onto your land?

1. Sow certified seed that has been produced in a blackleg free region. Alberta grown seed, while not guaranteed to be free of virulent blackleg, is your best choice.
2. Use fungicide treated seed. Most canola growers use a dual purpose seed treatment for blackleg, seedling blight, and flea beetle control. There are three fungicides effective against seed-borne blackleg — benomyl, carbathiin and iprodione. They are sold in combination with other fungicides and the insecticide lindane, under the trade names; Benolin-R, Thiralin-Plus, Gammasan+, Rovral ST Flowable, Vitavax RS Flowable and Vitavax RS Powder. These products are available from Federated Co-operatives Ltd., Chipman, May & Baker and Uniroyal agrochemical companies respectively.

Prevention is the best form of control. Careful choice of seed source and the use of a seed treatment will minimize the probability that this disease could obtain a foothold on your farm. In time, the virulent type of blackleg can be expected to spread to all of Alberta's canola growing areas, since the spores can move by wind many miles from infested fields.

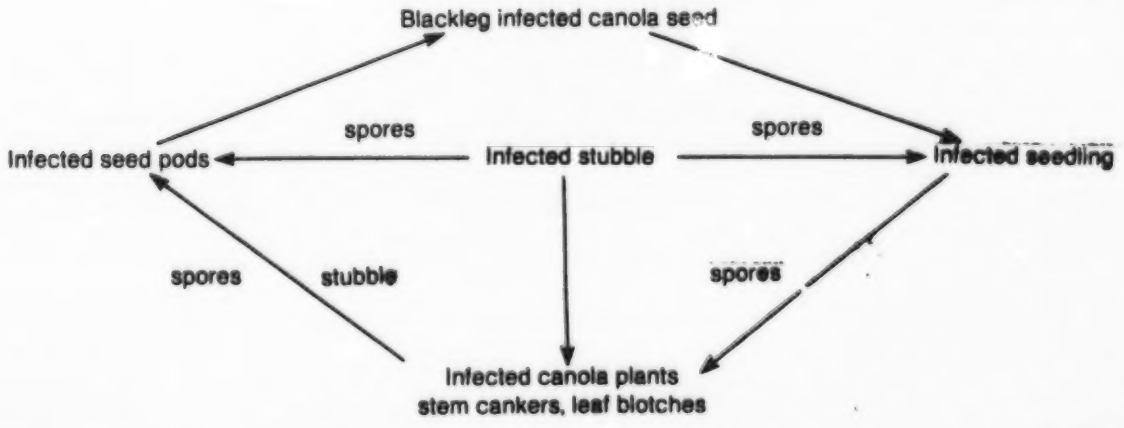
If the disease does occur in your canola crop, you can prevent its build up and possibly eliminate the disease by adopting recommended disease control procedures. Seed treatment is ineffective if canola is planted on known infested land, since virulent blackleg spores from the infected stubble can infect canola at any stage of growth.

How can blackleg infestations be controlled?

If virulent blackleg has been identified in a field of canola, what can be done? Canola stubble can produce infectious spores of this fungus for a number of growing seasons.

1. Plough or cultivate under the canola residue so that the stubble is buried that fall.
2. In the following season, use shallow minimum tillage or direct seeding of cereals to avoid bringing any canola residue to the surface. If the canola residue is below ground, infectious blackleg spores cannot be released into the air.
3. Ensure that your cereal crops are free of any wild mustard or volunteer canola. These weeds can become infected by the virulent blackleg fungus and harbor the disease until the next canola crop is planted.
4. Do not plant a canola crop near or adjacent to known infested land since spores can readily move short distances through the air during the spring and summer. In Saskatchewan, it has been noted that when a canola crop is planted next to badly infested land, heavy infection can take place in the neighboring canola. Infection levels in this adjacent crop of canola drop off as the distance from the infestation source increases.

Blackleg Disease Cycle



5. Keep known blackleg infested land in a non-host crop such as cereals, grasses, alfalfa, clover or peas for at least the following three years. Except in a succession of dry seasons, this would allow for complete breakdown (rotting) of the canola stubble. If the land were sown to canola in the fourth or subsequent year the blackleg fungus spores from the old infected stubble would be absent or at levels unlikely to cause any economic loss. However, even low levels of infection are important to canola growers. Low levels allow the blackleg disease to persist on the land and build up, if a strict crop rotation procedure is not followed.

By following these procedures to control blackleg, the build up and spread of this disease will be minimized. The longer high levels of this disease can be avoided in Alberta, the more time there is available for canola breeders to develop acceptable blackleg-resistant varieties. Plant breeders have already bred a Westar-type canola with resistance to this disease and expect to release it as a registered variety in the next year or so. A Tobin-type canola with blackleg resistance is being developed but it is a number of years away from actual release as an acceptable variety.

Information prepared by
I.R. Evans
Crop Protection Branch

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